Geophysical Research Abstracts
Vol. 21, EGU2019-16471, 2019
EGU General Assembly 2019

Potatoes vs 3D kinematics, what can we learn from models?

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2D modelling of passive margins has brought a lot of insights in their dynamic. At first simples, the models were not re-producing sufficiently well neither the complexities of real margins nor the duration of rifting. In order to reach more realistic results, a first type of approach is to complexify the physics by including more realistic rheological behaviours or coupling different physics like erosion sedimentation, melting etc… A second type of modification is to complexify the initial geometry of the models by including heterogeneities that range from initial layering with increasing layers with time, to inclusion of potatoes shaped heterogeneities. Both approached are successful at increasing the complexity of synthetic margins, and the second approach provides more control on the kinematic of the deformation, allowing, by adjusting the shape of heterogenities and their dips, the reproduction of the complex geometries observed on seismic profiles.

More recently, a new way to produce complexity is being explored, that is including a third dimension in the model and enabling the possibility to consider normal faults of finite length that interacts in time and space. Very high level of structural complexity emerges in 3D without including any of the previously cited arbitrary pre-existing structures. This rises the question of the title: potatoes vs 3D kinematic what can we learn from models?

To attempt an answer, I will compare carefully 2D models with heterogenities that produces geometry similar to 3D models with heterogenities and discuss their predictions in term of timing and thermal evolution. The discussion will focus on examples related to the opening of the North Atlantic.